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Caspian Oil and Gas: Production and Prospects

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Summary

There is a likelihood of large reserves of crude oil and natural gas in the Caspian Sea region, and a consequent large increase in oil and natural gas production from that area. Because diversity of energy sources is a consideration in Congressional deliberations on energy policy, this prospect could play a role in such discussions. However, there are notable obstacles to increases in Caspian Sea region production of oil and gas that may slow development. This report will be updated as events warrant.

The Caspian Sea is a 700-mile-long body of water in central Asia bordered by Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan. Among the five nations, only Iran is a member of the Organization of Petroleum Exporting Countries. Azerbaijan, Kazakhstan, and Turkmenistan became independent when the Soviet Union dissolved in 1991. The Caspian Sea region historically has been an oil and natural gas producer, but many believe that the region contains large resources of oil and gas capable of much greater production than at present.

Current Production and Proven Reserves

The Caspian Sea region presently is a significant, but not major, supplier of crude oil to world markets, based upon estimates by BP and the Energy Information Administration (EIA), U.S. Department of Energy. The Caspian region produced roughly 1.6 million barrels per day (bbls/day) including natural gas liquids in 2003, or 2% of total world output (**Table 1**).¹ More than a dozen non-Caspian countries each produce more than 1.5 million bbls/day. Caspian region production has been higher, but suffered during the collapse of the Soviet Union and the years following. Kazakhstan accounts for about 65% and Azerbaijan for about 20% of current regional crude oil output.

¹ Energy Information Administration. "Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts," at [http://www.eia.doe.gov/emeu/cabs/caspian_balances_files/sheet001.htm, viewed] March 4, 2005. The present report excludes Uzbekistan from regional totals, and only Caspian Sea region production and reserves are included in figures for Russia.

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Caspian region oil production comes from proven (economically recoverable) reserves of 17-18 billion bbls (**Table 2**). This is equal to 1.5% of total world proven reserves, and less than U.S. reserves (22 billion or 31 billion bbls, depending upon the estimator). Estimates of much larger “possible” reserves (**Table 2** also) suggest a potential for much greater production. However, as indicated by analysis later in this report, there are handicaps to increases in output both now and in the future.

The Caspian Sea region’s relative contribution to world supplies of natural gas is larger than that for oil. With gas output of about 2.6 trillion cubic feet per year (tcf/yr) in 2003 (**Table 1**), it accounted for almost 3% of world production. As with oil, gas production has been higher, but suffered during the collapse of the Soviet Union and the following years. Turkmenistan is the heavily predominant producer; with production of 1.9 tcf/yr, it accounts for about 75% of the region’s gas output.

Table 1. Oil and Gas Production in the Caspian Sea Region

Country	Crude Oil ^a (thousands of barrels per day)				Natural Gas (trillion cubic feet per year)		
	1992	2003	2010		1992	2003	2010
			Low	High			
Azerbaijan	222	329	789	1,290	0.28	0.20	0.60
Iran ^b	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Kazakhstan	529	1,034	748	2,400	0.29	0.49	1.24
Russia ^b	n.a.	n.a.	200		n.a.	n.a.	n.a.
Turkmenistan	110	203	475	1,000	2.02	1.89	4.24
Total Caspian	861	1,566	2,212	4,890	2.59	2.58	6.08
WORLD	73,935	76,777	95,100		72.195	92.433	105.00

n.a. - Not available from specified sources.

^a Includes natural gas liquids.

^b Regions near the Caspian Sea.

Sources: BP. *Statistical Review of World Energy 2004*, June 15, 2004; Department of Energy, Energy Information Administration (EIA). *Caspian Sea Region Country Analysis Brief*, December 2004; EIA. *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, December 2004; EIA. *International Energy Outlook 2004*, April 2004, at [<http://www.eia.doe.gov/oiaf/ieo>].

Unlike oil, the region’s proven reserves of natural gas are a higher proportion of the world total than is its natural gas production. In some important instances, exploration efforts hoping to find oil have found almost entirely gas instead. Estimates of proven reserves of natural gas in the Caspian Sea region by BP and the *Oil and Gas Journal* range as widely as those for oil — 170 tcf and 262 tcf, respectively, or 3.2% to 4.8% of the world total (table 2). Increases in Caspian Region gas production face obstacles somewhat similar to those that challenge further oil development and production.

Table 2. Estimates of Oil and Gas Reserves and Resources
(oil in billions of barrels/gas in trillions of cubic feet)

Region	Country	Proven Reserves		Possible Additional EIA ^a
		BP (End of 2003)	O & G Journal (1/1/05)	
Caspian Sea Region	Azerbaijan	7 (oil)/48 (gas)	7 (oil)/ 30 (gas)	32/35
	Iran ^b	0.1/0 ^c	n.a./n.a. ^c	15/11
	Kazakhstan	9/65	9/65	92/88
	Russia ^b	1/65 ^c	n.a./n.a.	7/n.a.
	Turkmenistan	0.5/101	0.5/71	38/159
	TOTAL	18/170	16.5/166	184/293
Reference Areas	United States	31/185	22/189	47/271 ^d
	North Sea ^e	15/120	15/108	n.a.
	Saudi Arabia	263/236	259/235	n.a.
	WORLD	1,148/6,205	1,278/6,040	n.a.

EIA - Energy Information Administration.

n.a. - Not available from sources listed below.

^a Excludes proven reserves. Data from various sources compiled by EIA in *Survey* cited below.

^b Only regions near the Caspian Sea are included. ^c Data from EIA.

^d Undiscovered conventional oil and gas.

^e Includes Denmark, Germany, Netherlands, Norway, and United Kingdom.

Sources: BP. *BP Statistical Review of World Energy 2004*. June 15, 2004; Penwell Publishing Company. *Oil & Gas Journal*. December 20, 2004; Department of Energy, EIA. *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, December 2004; U.S. Geological Survey. "National Oil & Gas Assessment," at energy.cr.usgs.gov/oilgas/noga/2004update.htm, viewed March 1, 2005.

Resource and Production Prospects

There is a likelihood of much greater additional reserves of crude oil and natural gas being found in the Caspian Sea region. This is backed up by the fact that a number of oil companies have large stakes there. Much of the known reserves have not been developed yet, and development usually leads to discovery that prospects are larger than originally estimated. Moreover, many areas remain unexplored. The EIA estimates that an *additional* 184 billion barrels crude oil reserves are possible,² which would raise the total to well over 10 times its present level. This level of proven reserves would equal about 75% of the amount now held by Saudi Arabia (**Table 2**) and could come to roughly 15% of total world reserves. If the high output projection in **Table 1** comes to pass, Caspian Sea region oil production will roughly triple by 2010 – to about 4.9 million bbls/day.

The prospective increase in natural gas proven reserves appears to be much smaller in relative terms than for oil, but still very large. It is estimated that there are nearly 300 tcf in *additional* natural gas reserves in the region (**Table 2**). Should this be the case, total Caspian region proven reserves in 2010 would put the region's proven gas reserve total at about 2.75 times its present level and far exceed present Saudi Arabian natural gas reserves. Given such expectations, it is estimated that Caspian Region natural gas production would exceed six tcf by 2010.

² *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, December 2004.

Any comparison of the volumes of Caspian Sea region oil and natural gas reserves versus those of Saudi Arabia, however, must be tempered by acknowledgment of the considerable advantage of Saudi oil and gas in terms of much lower costs of production and much easier market access. Also, whatever the quantities and the production costs of their energy resources, Caspian countries' ability to develop and bring them to market could depend to some extent on the ability to establish and maintain relationships with international energy companies

Present and Prospective Markets

In view of the above, Caspian region countries potentially are large exporters of oil and gas. Caspian Sea region oil and gas has several markets now and a wider variety of potential markets. These include nations trying to meet their economies' demand for energy and those that also wish to reduce their dependence on Persian Gulf energy.

Now, nearly all Caspian crude oil goes north and/or west. Reflecting the Soviet era dictates and infrastructure, it travels largely via pipeline to and/or through Russia to European markets, with refineries as part of the network. Some also goes by tanker through the Bosphorus straits to Western European markets via the Mediterranean. Natural gas transportation, even more than oil, is tied to pipelines going mainly north and/or west through Russia and its monopoly pipeline — Transneft. This, together with the fact that Russia itself produces oil and gas, provides Russia with the market power to collect transit fees on Caspian energy shipped through its transportation network, and to determine in some cases how much it is willing to transport. Also, because energy competes on a delivered-cost basis, reflecting transit fees, Caspian energy wellhead prices suffer. Caspian region countries thus have incentives to develop alternatives to routes through Russia — possibly consortia of routes that would avoid long transits through Russia in reaching European and other markets *and* provide leverage in negotiating transit fees on shipments that do go through the Russian pipeline system.

Caspian energy sources are attractive to Turkey: they are close and offer Turkey an opportunity to offset part of its energy import bill through transit fees for shipments across its territory. Turkey's energy use is growing much faster than its output, making it a rapidly growing importer of both oil and gas; it already is a large market for Russian gas. Also, Turkey has very good relations with Caspian and Central Asian countries. However, some observers believe that Turkey has been optimistic in its expectations of natural gas consumption, and overcommitted itself to future imports of gas.

East Asian countries also are potentially attractive markets. Japan already imports a significant quantity of gas; and energy consumption in India and Pakistan is growing rapidly. Perhaps most significant, China's proven oil and gas reserves are small compared with the current and potential size of its economy and recent steep increases in its oil consumption. This has led to the building of a pipeline from Kazakhstan to China.

The prospects of Caspian energy exports to the regions identified above may be limited by newly expanding or developing non-Caspian energy exports to those regions. These developments include expansion of North Africa's gas export capacity, discovery of a large natural gas province in and near Egypt, development of a large gas field in Pakistan, and growing liquefied natural gas export capacity of Persian Gulf nations.

Challenges to Further Development

There are, however, inter-related geographical, political, economic, technological, legal, and psychological obstacles to the further exploration for and development of Caspian Sea region energy resources.

Because the Caspian Sea is landlocked and the region's nations are distant from the largest energy markets, transportation must at least begin by pipeline, followed in many cases by tanker through the shallow and congested Bosphorus straits. Pipelines from the Caspian region completed before 1997, except those in northern Iran, were routed to Russia and designed to link the former Soviet Union internally. The several pipelines now operating have sufficient capacity to handle present production, but little more. Completion of the CPC pipeline from Kazakhstan's Tengiz oilfield to Novorossiisk (Russia) on the Black Sea in 2001 and its planned expansion is notable, but the *effective* capacity of the CPC line, and that of others, may be constrained by limits on tanker passage through the Bosphorus.³ When the BTC pipeline (**Table 3**) is completed in the second half of 2005, its capacity plus that of the operating pipelines will total 2.1 million bbls/day. New pipelines to serve east Asian markets have economic potential but could be lengthy, and entail transit through Afghanistan, Iran, and/or Pakistan. Routes to east Asian markets via Iran would include shipping through the Persian Gulf.

These issues are complicated by the fact that pipeline routes face potential disruption by regional conflicts. These include longstanding tension between India and Pakistan, continuing unsettled conditions in Afghanistan, the Armenia-Azerbaijan dispute over Nagorno-Karabakh, separatist efforts in Georgia, and military activity in Chechnya.

It is deducible from the above that deciding upon pipeline routes that have a reasonable assurance of security and are politically acceptable to parties with influence in the region are hurdles in the development of Caspian Sea region energy resources.

On the purely economic side, the longer the pipeline route, the less attractive it is to producers, other things being equal, inasmuch as energy competes on a delivered-cost basis and transit fees (based upon distance) effectively lower the wellhead price received by producers. Because transit fees are a source of revenue to governments, politics as well as economics come into play in pipeline route selection. Built-in precautions to minimize environmental impacts, particularly in and around the Sea, add to pipeline costs.

In addition, much of Caspian energy resources are offshore, requiring special large drilling rigs. Very limited rig production capacity in the relatively isolated region makes the acquisition of rigs expensive and logistically difficult, hampering development of Caspian energy resources. This situation is easing a little as one new rig was added to the fleet in the past year and another is in the production pipeline.

³ Limited depth, heavy traffic, and environmental considerations have resulted in restrictions on travel through the Bosphorus by Turkish authorities. Supporters of the Baku to Ceyhan pipeline assert that Ceyhan, a Turkish Mediterranean Sea port, can handle very large carriers, while the Supsa and Novorossiisk ports are restricted to smaller tankers that can transit the Bosphorus. Also, Ceyhan can remain open all year, whereas Novorossiisk is closed up to two months per year.

Full realization of the energy potential of the region also is impeded by the unresolved legal status of the Caspian Sea. Despite a number of efforts, so far only Azerbaijan, Kazakhstan, and Russia among the littoral states have reached agreement on delineating ownership of the Sea's resources or their rights of development. Potential wealth from development heightens the stakes for each country, leading to conflicts over claims to promising regions.

Investment enthusiasm slackened after the surge of production-sharing agreements during the early and mid 1990s. Some recent exploration efforts have had disappointing results, particularly with respect to oil. Somewhat reduced activity, from less investment, has reduced the rate of discovery, with a further psychological effect. On the other hand, the March 2003 acquisition by China of a large stake in the North Caspian Sea Project suggests some confidence in the prospects of a least one large venture.

Despite the obstacles discussed above, energy development in the Caspian Sea region is proceeding and is likely to proceed further given the widely perceived prospect of very large energy resources in the Caspian Sea region. The pace of development, however, may be less rapid than might be the case with fewer hurdles.

Table 3. Selected Oil Pipeline Routes from the Caspian Sea Region

Pipeline	Route	Length (Miles)	Capacity (bbls/day)	
			2001/2002	2010/2015
Operating				
Atyrau-Samara	Atyrau, Kazakhstan, to Samara, Russia	432	310,000	500,000
Baku- Novorossiisk	Baku, Azerbaijan, via Chechnya, to Novorossiisk, Russia/Black Sea (northern route)	868	100,000	300,000 (possible)
Baku-Novorossiisk	Baku to Novorossiisk via Dagestan, Russia	204	120,000	360,000 (planned)
Baku-Supsa	Baku to Supsa, Georgia/Black Sea	515	100,000	100,000
Caspian Pipeline Consortium (CPC)	Tengiz oil field, Kazakhstan, to Novorossiisk	980	560,000	1,340,000 (planned)
Under Construction, Planned, or Proposed				
Baku-Ceyhan (BTC) (under construction)	Baku to Tbilisi, Georgia, to Ceyhan, Turkey/Mediterranean Sea	1,040	1,000,000	1,000,000
Iran Oil Swap (under construction)	Neka (Iranian port) to Persian Gulf; oil will be swapped for equivalent amount	208	175,000	370,000
Kazakhstan- Turkmenistan- Iran (proposed)	Kazakhstan, via Turkmenistan, to Kharg Island, Iran, on Persian Gulf	930	1,000,000	1,000,000
Kazakhstan-China (under construction)	Aktyubinsk (Kazakhstan) Xingjiang (China)	613	200,000	400,000

Sources: BG Group plc. BG Country Operations - Kazakhstan, [<http://www.bg-group.com/international/int-kaz.htm>], viewed on March 4, 2005; U.S. Department of Energy, Energy Information Administration (EIA), *Caspian Sea Region Country Analysis Brief*, December 2004; EIA, *Caspian Sea Region: Reserves and Pipelines*, Table 4, July 2002; EIA, *Kazakhstan Country Analysis Brief*, November 2004. For EIA Country Analysis Briefs and related data, see [<http://www.eia.doe.gov/emeu/cabs/>].